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(54) **Improvements in or relating to repellent compositions.**

(57) A repellent composition e.g. for repelling deer comprises a synthetic blend of components which are characteristic of the acid fraction obtained by a Soxhlet extraction of lion faeces followed by separation into basic, neutral and acid fractions; and feline. The composition may comprise saturated alkanolic acids with carbon atoms in the range of 3-20; saturated aliphatic alcohols with carbon atoms in the range 14-16; various compounds containing primary or secondary amino groups and having carbon atoms in the range 3-9; a fermented egg product; a bittering agent and an adhesive agent.

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## IMPROVEMENTS IN OR RELATING TO REPELLENT COMPOSITIONS

This invention is concerned with improvements in or relating to repellent compositions, particularly but not exclusively for repelling animals such as deer.

In for example forestry, damage by deer is a recurrent problem particularly in the case of softwood saplings.

It is an object of the present invention to provide an improved repellent composition and method.

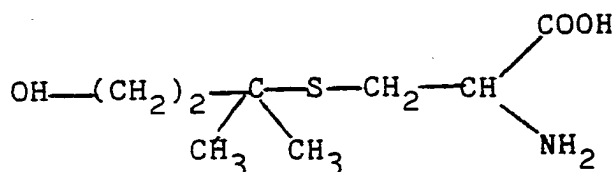
It is known that deer have an innate fear and flight response to the aroma of lion faeces, and this occurs even when the deer have lived all their lives in territories where lions are not endemic.

This property of lion faeces can be used to repel deer from for example areas of forestry where they could otherwise cause damage, but clearly, at least in territories where lions are not endemic, it is impracticable and uneconomical to spread lion dung around the area to be protected. This difficulty could be overcome if the active constituents of the lion faeces are identified and corresponding synthetic blends of chemicals prepared.

Lion faeces comprises a complex mixture of chemicals including steroids but we have found that deer are repelled by a synthetic blend of compounds which are characteristic of the acid fraction obtained by a Soxhlet extraction of lion faeces followed by separation into basic, neutral and acid fractions: important constituents of this acid fraction are saturated alkanolic acids.

Such compounds also appear in the anal sac secretion of lions and in fox's urine.

Another animal repellent is felinine, which is a constituent of cat's urine and has the structure



Felinine exists as L- and D- enantiomers, we believe the compound we have employed consists essentially of the L- enantiomer.

We have found that compositions comprising the blends referred to hereinabove and felinine exhibit a synergistic repellent effect.

The invention provides a repellent composition comprising (a) a synthetic blend of components which are characteristic of the acid fraction obtained by a Soxhlet extraction of lion faeces followed by a separation into basic, neutral and acid fractions; and (b) L- felinine.

The invention also provides a repellent composition comprising (a) a synthetic blend of saturated alkanolic acids with carbon atoms in the range of 3-20; and (b) felinine.

The saturated alkanolic acids may be straight or branched chain acids.

Examples of saturated alkanolic acids include:

- n-Propanoic acid
- 2-Methyl propanoic acid
- n-Butanoic acid
- 2-Methyl butanoic acid
- 3-Methyl butanoic acid
- n-Pentanoic acid
- 4-Methyl pentanoic acid
- n-Heptanoic acid
- 2-Methyl hexanoic acid
- n-Heptanoic acid
- n-Octanoic acid
- 4-Methyl octanoic acid
- n-Nonanoic acid
- 4-Methyl Nonanoic acid
- n-Decanoic acid
- n-Undecanoic acid
- n-Dodecanoic acid
- n-Tridecanoic acid

n-Tetradecanoic acid (myristic acid)

n-Pentadecanoic acid

n-Hexadecanoic acid (palmitic acid)

n-Octadecanoic acid (stearic acid)

5 n-Eicosanoic (arachidic acid)

The weight ratio of felinine to saturated alkanolic acids in a composition according to the invention can vary widely for example over the range 0.25:1 to 30:1, e.g. 10:1 to 25:1.

The invention also provides a method of repelling animals e.g. deer wherein a composition according to the invention is employed.

10 A composition according to the invention may comprise at least one saturated aliphatic straight or branched chain alcohol with carbon atoms in the range 6-18 e.g. 14-16; examples include n-tetradecanol; n-pentadecanol; and n-hexadecanol.

The weight ratio of C<sub>14</sub>-C<sub>16</sub> saturated aliphatic alcohols to saturated alkanolic acids is for example in the range 0.02-0.05:1.

15 A composition according to the invention may comprise at least one aryl-(e.g. phenyl-) or substituted aryl-(e.g. hydroxyphenyl-) saturated alkanolic (e.g. acetic or propanoic) acid; examples include phenyl acetic acid and 3-phenyl propanoic acid.

A composition according to the invention may comprise any or all of pyrrolidine; piperidine; 2-pyrrolidone; 2-phenyl ethylamine; 3-methyl indole; diethylamine; n-propylamine; n-butylamine and 3-methyl 20 butylamine each in weight ratio to saturated alkanolic acids in the composition of about 0.025:1. These compounds contain primary or secondary amino groups and have carbon atoms in the range 3-9; and compositions containing them may exhibit a particularly enhanced degree of synergism.

A composition according to the invention may comprise any of:

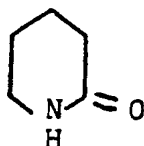
2-Phenyl ethanol

25 Phenol

5-Amino-valeric acid

2-Piperidone ( $\gamma$ -valerolactam)

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35

4-Methyl phenol

Indole

Oxindole

Oleic acid

40 Linoleic acid

Cholesterol

Benzothiazole

2-Phenoxyethanol

$\gamma$ -Decalactone

45 Palmitoleic acid (cis-9-hexadecenoic acid)

Elaidic acid

Linolenic acid

Eicosenoic acid

3 $\beta$ -Cholesterol.

50 5-amino-valeric acid may be regarded as a precursor of 2-piperidone.

A composition according to the invention may comprise any or all of:

3-Mercapto propan-1-ol

3-(Methylthio) propanol

Dimethyl sulphide

55 Dimethyl trisulphide

Dimethyl tetrasulphide

N-(2-Phenylethyl) acetamide

N-Butyl-N-ethyl acetamide.

The acetamides can be synthesised from the corresponding amines, phenylethylamine and N-ethyl butylamine, respectively. J. March "Advanced Organic Chemistry" 3rd Edition - page 370, 1985.

A composition according to the invention may comprise a fermented egg product, which is prepared for example by the bacterial fermentation of whole chicken eggs, e.g. of the order of about 35 whole eggs per gram of saturated alkanolic acids in the composition.

Bullard *et al.* in J. Agric. Food Chem. Vol. 26, No. 1 1978 - page 155 *et seq.* also describe a fermented egg product.

A composition according to the invention may comprise an agent to impart to it a bitter flavour with a view for example to counteracting any tendency for the deer in time to overcome their natural repugnance to the odour of the composition.

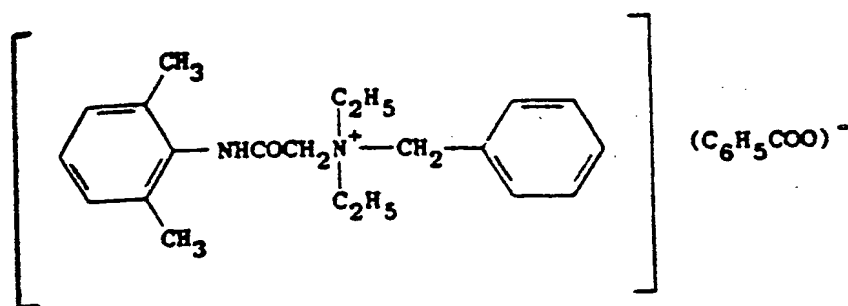
Bittering agents include brucine, quassin, sucrose octa-acetate, quinine, caffeine and various tannins, e.g. spray dried bark as used in the tanning industry; but we prefer to use Bitrex: denatonium benzoate, and in an amount up to for example 2% by weight of the composition.

Denatonium benzoate has the formula:

15

20

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Compositions according to the invention may incorporate for example an inert carrier (e.g. a solvent or a solid excipient) for the active ingredients. The composition may for example be dispersed by spraying, spreading, diffusion or other sustained release mechanism.

One useful carrier for example, comprises an agent to impart adhesive properties to the composition so that it sticks readily to foliage and the like; examples include polybutene polymers, acrylic vinyl acetate copolymers emulsified asphaltic materials, and acrylic polymers, e.g. an adhesive aqueous acrylic emulsion which dries out on spraying and exposure to the air. We prefer to use Primal AC-33, understood to comprise 45-49% acrylic copolymer in water and in an amount e.g. 90-99% Primal by weight of the composition.

#### Fractionation of a Soxhlet Extraction of Lion Faeces

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A method of Soxhlet extraction followed by separation into basic, neutral and acid fractions is described in relation to coyote urine by R. Teranishi *et al.* "Worldwide Furbearers' Conference Proceedings" Volume III (1980) pages 1839-1851 (see particularly page 1843) Editors J.A. Chapman and D. Pursley. We applied this method to lion faeces.

45

The lion faeces was Soxhlet extracted using 1,1,2-trichloro-trifluoroethane (hereinafter "Freon") as the solvent. The extract was washed with 2% w/v sodium bicarbonate and separated into aqueous (a) and non-aqueous solvent (b) fractions.

The aqueous fraction (a) was acidified with 2M HCl and solvent extracted again with Freon to yield a solvent fraction (d) and an aqueous fraction (e); an "acid" faeces extract fraction was obtained from the solvent fraction (d).

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#### Analysis I

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Acid Extract of Lion Faeces

The method of analysis was gas chromatography with flame ionisation detection, and coupled gas chromatography/mass spectrometry.

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		<u>% by weight</u>
10	n-Propanoic acid	0.32
	2-Methyl propanoic acid	2.60
	n-Butanoic acid	12.88
	2-Methyl butanoic acid	40.95
	n-Pentanoic acid	2.09
15	4-Methyl pentanoic acid	7.37
	n-Hexanoic acid	1.52
	2-Phenyl ethanol	0.18
	Phenol	6.06
	2-Piperidone	0.51
20	4-Methyl phenol	2.04
	n-Octanoic acid	0.19
	n-Decanoic acid	0.32
	Indole	4.38
	n-Dodecanoic acid	0.20
25	3-Phenyl propanoic acid	14.32
	n-Tetradecanoic acid (myristic acid)	0.35
	Oxindole	0.25
	n-Hexadecanoic acid	1.76
	n-Octadecanoic acid	1.71
30		<u>100.00</u>

35 Analysis II

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Lions' Anal Sac Secretion

The method of analysis was as for the lion faeces.

		<u>% by weight</u>
5	n-Propanoic acid	0.84
	2-Methyl propanoic acid	3.57
	n-Butanoic acid	0.55
10	3-Methyl butanoic acid	37.15
	2-Methyl butanoic acid	3.49
	n-Pentanoic acid	1.09
	2-Methyl pentanoic acid	0.61
	4-Methyl pentanoic acid	0.79
15	n-Hexanoic acid	2.14
	2-Methyl hexanoic acid	3.53
	4-Methyl hexanoic acid	1.49
	n-Heptanoic acid	1.93
	2-Methyl heptanoic acid	2.58
20	4-Methyl heptanoic acid	0.63
	n-Octanoic acid	3.27
	2-Methyl octanoic acid	2.50
	4-Methyl octanoic acid	0.47
	n-Nonanoic acid	0.52
25	n-Nonanol	0.34
	n-Decanol	4.23
	Decan-2-ol	0.59
	n-Undecanol	7.42
	n-Dodecanol	13.72
30	n-Tridecanol	4.29
	n-Tetradecanol	1.72
	n-Pentadecanol	0.20
	n-Hexadecanol	0.34
35		<u>100.00</u>

Weight ratio of C<sub>11</sub>-C<sub>16</sub> saturated aliphatic alcohols to saturated alkanolic acids: 0.034:1.

Synthetic blends can be prepared corresponding precisely to Analysis I or Analysis II. However we have  
40 found that, conveniently, modifications to these recipes can be made.

Synthesis of Felinine45 Crude Aqueous Solution

L-cysteine monochloride monohydrate (116g, 0.66 moles) is added to a stored solution of concentrated hydrochloric acid (125 ml) and water (375 ml). The solution is cooled to -0°C and 3-methyl-3-buten-1-ol (115g, 1.34 moles) is added dropwise to the acid solution while maintaining the temperature below 10°C.

50 The reaction mixture changes from colourless to white to yellow as it is allowed to warm up to room temperature, and stirring continued for 16 hours.

The yellow reaction mixture is cooled to -0°C and a solution of sodium hydroxide (50g) in water (100 ml) is added dropwise while maintaining the temperature below 20°C.

55 The reaction mixture is extracted with diethyl ether (4 × 100 ml). The aqueous layer is concentrated in vacuo at room temperature.

The crude aqueous layer (876g) may be used without further purification.

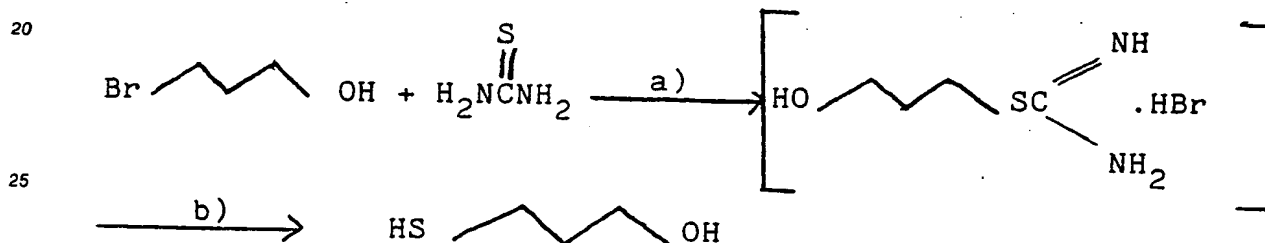
This aqueous solution contains felinine, sodium chloride, unreacted L-cysteine monochloride monohydrate and a trace quantity of 3-methyl-3-buten-1-ol; calculated quantity of felinine in solution is 0.119g felinine equivalent to 1.09g crude solution, (i.e. 10.92% felinine w/w).

### Crude Solid

Reference may be made to "The Merck Index" Tenth Edition - Monograph 3883.

### Synthesis of 3-Mercapto-propan-1-ol

Preparation of mercaptans (thiols) can be achieved (1) by reacting an alkyl halide with thiourea to give an isothiurea hydrohalide, subsequent alkaline hydrolysis of this salt affords the mercaptan (thiol). The synthesis of 3-mercapto-propan-1-ol (2) is outlined in Scheme 1.



Scheme 1

a) 95% ethanol, 6h reflux, 16h room temperature

b) 10% NaOH (aq), 3h reflux.

### Method

In a 100 ml round bottomed flask equipped with magnetic stirrer bar are placed 3-bromopropan-1-ol (5g, 0.036m) and 95% ethanol (25 ml) to this is added thiourea (2.7g, 0.036m) in one portion and the mixture heated to reflux for 6 hours, the mixture is allowed to cool to room temperature overnight. The solvent is removed in vacuo to afford the white crystalline isothiuronium bromide (7.7g, 100%), to this is added a 10% aqueous solution of sodium hydroxide (2.9g, 0.072m) and the mixture heated under reflux for 3 hours. The mixture is allowed to cool and the aqueous washed with dichloromethane (2 × 25 ml), the aqueous is then acidified with concentrated hydrochloric acid and extracted with dichloromethane (2 × 25 ml), dried over magnesium sulphate and concentrated in vacuo to afford a clear oil of crude 3-mercapto propan-1-ol 2.1g (63%). GLC analysis showed this to be of 95% purity.

Distillation of the crude affords a clear oil with a boiling range of 75-80°C at 7 mm Hg pressure.

### References

1. Fieser and Fieser Reagents for Organic Synthesis p. 1165 (Vol. 1).
2. Clinton *et al.* JACS 67, 594-7, 1945.

### Example 1

Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
5	n-Propanoic acid	0.34
	2-Methyl propanoic acid	2.57
	n-Butanoic acid	12.88
	2-Methyl butanoic acid	40.91
10	n-Pentanoic acid	1.97
	4-Methyl pentanoic acid	7.59
	n-Hexanoic acid	1.59
	2-Phenyl ethanol	0.26
	Phenol	5.98
15	2-Piperidone	0.50
	4-Methyl phenol	2.01
	n-Octanoic acid	0.25
	n-Decanoic acid	0.32
	Indole	4.30
20	n-Dodecanoic acid	0.20
	3-Phenyl propanoic acid	14.20
	n-Tetradecanoic acid (myristic acid)	0.35
	Oxindole	0.30
	n-Hexadecanoic acid	1.74
25	n-Octadecanoic acid	1.74
		<u>100.00</u>

30 The blend is based on Analysis I - acid extract of lion faeces.  
2-piperidone may be substituted by 5-amino valeric acid.

Composition

35		
	<u>Ingredients</u>	<u>% by weight</u>
	Synthetic blend	1.0
40	Felinine (crude solid)	0.2
	Freon (solvent)	<u>98.8</u>
		<u>100.0</u>

45 Weight ratio of felinine to saturated alkanolic acids: 0.28:1.  
0.6 grams of the synthetic blend plus felinine was dissolved in 49.4 grams of Freon.  
Deer were presented with food in buckets treated with the synthetic blend by spraying on the equivalent  
of 2 ml neat blend in the Freon solution; the deer were also presented with untreated food in other buckets;  
50 their behaviour was observed and recorded by video.  
The deer showed signs of distress and a flight response away from the buckets containing the food with  
the synthetic blend. They showed no such response to the untreated food.

55 Example II



Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
5	Acetic acid	0.93
	n-Propanoic acid	0.81
	2-Methyl propanoic acid	0.31
10	n-Butanoic acid	0.37
	2-Methyl butanoic acid	0.18
	3-Methyl butanoic acid	0.18
	4-Methyl pentanoic acid	0.18
	Phenyl acetic acid	5.89
15	3-Phenyl propanoic acid	31.22
	p-Hydroxy phenylacetic acid	8.50
	3-(p-Hydroxyphenyl)propanoic acid	51.43
		<u>100.00</u>

16 grams of this blend was dissolved in 500 ml diglyme.

The blend is based on published work on the acid constituents and proportions thereof in lion anal sac secretion (E.S. Albone et al. - "Life Sciences" Vol. 14 pp. 387-400 (1974)).

25 The blend was tested as in Example I except that instead of spraying the blend onto the food, a perforated plastic vessel filled with cotton wool was placed in the appropriate bucket with 2 ml of neat blend on the cotton wool. Similar results were obtained as in Example I. Synergistic results were obtainable with a composition also comprising felinine.

30 Example III

Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
35	Acetic acid	4.00
	n-Butanoic acid	4.00
40	2-Methyl propanoic acid	6.00
	3-Methyl butanoic acid	80.00
	Trimethylamine	6.00
		<u>100.00</u>

2.5 grams of this blend was dissolved in a solvent comprising 5 grams of propane diol.

This blend is based on the known constituents of fox urine.

50 The blend was tested as in Example II with similar results, with again improved results obtainable with a composition also comprising felinine.

Example IV

55

Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
5	n-Propanoic acid	1.09
	2-Methyl propanoic acid	3.99
	n-Butanoic acid	0.69
	3-Methyl butanoic acid	41.12
10	2-Methyl butanoic acid	3.92
	n-Pentanoic acid	1.84
	4-Methyl pentanoic acid	0.88
	n-Hexanoic acid	2.35
	n-Heptanoic acid	2.23
15	n-Octanoic acid	3.71
	4-Methyl octanoic acid	0.72
	n-Nonanoic acid	0.64
	n-Nonanol	0.40
	n-Decanol	4.78
20	Decan-2-ol	0.66
	n-Undecanol	8.28
	n-Dodecanol	15.22
	n-Tridecanol	4.79
	n-Tetradecanol	2.06
25	n-Pentadecanol	0.30
	n-Hexadecanol	0.33
		<hr/> 100.00 <hr/>

30

Weight ratio of C<sub>4</sub>-C<sub>16</sub> saturated aliphatic alcohols to saturated alkanolic acids: 0.043:1.  
 This blend is based on Analysis II - Lions' anal sac secretion.  
 Synergistic results are obtainable when used with feline.

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Example V

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45

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55

Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
5	n-Propanoic acid	1.286
	2-Methyl propanoic acid	2.681
	n-Butanoic acid	5.685
	2-Methyl butanoic acid	3.760
10	3-Methyl butanoic acid	3.688
	n-Pentanoic acid	0.486
	4-Methyl pentanoic acid	0.450
	n-Hexanoic acid	0.414
	2-Methyl hexanoic acid	0.126
15	2-Phenylethanol	0.207
	Benzothiazole	0.072
	n-Heptanoic acid	0.369
	Phenol	4.885
	4-Methyl phenol	3.338
20	5-Aminovaleric acid	0.837
	2-Phenoxyethanol	0.207
	n-Octanoic acid	0.414
	4-Methyl octanoic acid	0.081
	n-Nonanoic acid	0.261
25	4-Methyl nonanoic acid	0.081
	n-Tetradecanol	0.090
	n-Decanoic acid	0.243
	n-Pentadecanol	0.369
	γ-Decalactone	0.108
30	n-Undecanoic acid	0.171
	Indole	8.590
	n-Hexadecanol	0.504
	n-Dodecanoic acid	0.432
	Phenyl acetic acid	0.207
35	3-Phenyl propanoic acid	1.116
	n-Tridecanoic acid	0.153
	n-Tetradecanoic acid (myristic acid)	1.934
	Oxindole	1.529
	n-Pentadecanoic acid	0.126
40	Palmitic acid (n-hexadecanoic acid)	11.721
	Palmitoleic acid (cis-9-hexadecenoic acid)	1.772
	Stearic acid (n-octadecanoic acid)	4.453
	Oleic acid	6.188
	Elaidic acid	1.898
45	Linoleic acid	3.409
	Linolenic acid	1.340
	Arachidic acid (n-eicosanoic acid)	0.225
	Eicosenoic acid	0.036

50

Example V (continued)

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Synthetic Blend

	<u>Active Ingredients</u>	<u>% by weight</u>
5	3 $\beta$ -Cholestanol	5.047
	Cholesterol	10.911
	Pyrrolidine	0.900
	Piperidine	0.900
10	2-Pyrrolidone	0.900
	2-Phenylethylamine	0.900
	3-Methyl indole	0.900
	Diethylamine	0.900
	n-Propylamine	0.900
15	n-Butylamine	0.900
	3-Methyl butylamine	0.900
		<u>100.000</u>

20

Weight ratio of C<sub>14</sub>-C<sub>16</sub> saturated aliphatic alcohols to saturated alkanolic acids: 0.025:1.

Weight ratio of each of pyrrolidine, piperidine, 2-pyrrolidone, 2-phenyl ethylamine, 3-methyl indole, diethylamine, n-propylamine, n-butylamine and 3-methyl butylamine to saturated alkanolic acids: 0.023:1.

25

The blend was prepared by step-wise addition of components, followed by ultrasonic treatment to homogenize.

Composition

30

	<u>Ingredients</u>	<u>grams</u>	<u>% by weight</u>
	Synthetic blend	.004	0.16
35	Felinine	.034	1.38
	Bitrex	.002	0.08
	Primal AC-33	2.4	97.73
	Acetone (solvent)	.016	0.65
		<u>2.456</u>	<u>100.00</u>

40

Weight ratio of felinine to saturated alkanolic acids: 22:1.

The synthetic blend was first dissolved in the acetone with step-wise addition of the remaining components and vigorous manual shaking. The felinine was provided as .31 grams of the crude reaction mixture of felinine in water containing also sodium chloride, unreacted L-cysteine monochloride monohydrate and a trace quantity of 3-methyl-3-buten-1-ol. The Bitrex was provided as 0.78 ml of a 0.256% weight/volume solution.

The composition was dissolved in water to 50 ml giving a concentration of synthetic blend of 0.008% weight/volume synthetic blend and 0.068% weight/volume felinine.

The aqueous composition was sprayed onto dried lucerne pellets, which were then allowed to dry overnight; the solution was sprayed in the amount of 50-ml solution/2 kg lucerne pellets.

A regular rectangular pattern of 6 buckets was provided in a restricted outside pen with the buckets arranged in (plan view) three side-by-side pairs. Each bucket contained initially 2 kg. of dried lucerne pellets. One bucket of each pair contained the treated pellets, the other bucket of the pair containing untreated lucerne pellets acting as a control. The treated bucket of the middle pair was on the other side of the rectangle from the treated buckets of the other two pairs.

Five red deer were starved for 24 hours and then allowed into the pen with their movements being

recorded on video camera. Every hour for 8 hours the buckets were weighed to establish the quantity of food consumed; water was available ad libitum. After 4 hours the position of the control bucket and treated bucket of each pair were reversed to counteract any positional bias.

The Table shows the percentage of the food consumed at hourly intervals.

Table

Time (hrs)	<u>Pair 1</u>		<u>Pair 2</u>		<u>Pair 3</u>	
	<u>Control</u>	<u>Treatment</u>	<u>Control</u>	<u>Treatment</u>	<u>Control</u>	<u>Treatment</u>
0	0	0	0	0	0	0
1	41		27 1/2		73 1/2	
2	63		29		86	
3	84		29		95	
4	100		29		99	
5			94 1/2		100	
6		0	100			
7		8 1/2				
8	100	8 1/2	100	0	100	0

The video observations showed the deer had a considerable aversion to the treated buckets.

Similar experiments with a 0.256% weight/volume Bitrex solution alone sprayed onto lucerne pellets in amounts of 0.8-39 ml per bucket resulted in 18-37% of the food in the treated buckets being consumed as compared with 43%-100% in the control buckets.

The deer were repeatedly tested as above with comparable results being obtained.

#### Example VI

Synthetic Blend: as in Example V

Composition

	<u>Ingredients</u>	<u>grams</u>	<u>% by weight</u>
5	Synthetic blend	0.50	.78
	Felinine	2.99	4.68
	Bitrex	0.05	0.08
	Primal AC-33	58.60	91.68
10	Acetone	1.78	2.78
		<u>63.92</u>	<u>100.00</u>

15 Weight ratio of felinine to saturated alkanolic acids: 15:1.

The blend and composition were prepared substantially as in Example V. The felinine was provided as 27.4 grams of the crude reaction mixture. The Bitrex was provided as 19.5 ml of the 0.256% solution. The composition was dissolved in water to 1250 ml giving a concentration of 0.04% weight/volume synthetic blend and 0.24% weight/volume felinine.

20 When the 1250 ml of the aqueous composition is sprayed onto 25 Scots Pine saplings in a large relatively unrestricted wooded enclosure excellent deer repelling results may be observed; with no significant repellent effect when Primal is sprayed on alone in a control experiment.

25 Example VII

The procedure of Example VI was followed using the aqueous composition of that Example with the addition of the product of fermenting 7 whole chicken's eggs which represents 35.9 eggs per gram of saturated alkanolic acids in the blend; the fermented egg was slurried in a little water before blending in. Excellent deer repelling results may be observed, following spraying onto Scots Pine saplings as in Example VI.

We have found that for example red deer, Pere David deer and Sika deer were all effectively repelled by compositions embodying the invention.

35 It will be realized that any one of the active compounds described hereinbefore alone or in admixture with one or more of the other active compounds may have an animal repellent effect per se.

We wish to record our appreciation of the valuable contributions made by The Zoological Society of London in the provision of materials and test facilities, and the Forestry Commission at Alice Holt Lodge, Research Station, Farnham, England.

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Example VIII

The blend and composition of Example V were modified by the addition of the following components in amounts by weight based on 100 grams of the unmodified blend of Example V

		<u>grams</u>
10	3-Mercapto propan-1-ol	0.015
	3-(Methylthio) propanol	0.014
	Dimethyl sulphide	0.076
15	Dimethyl trisulphide	0.051
	Dimethyl tetrasulphide	0.015
20	N-(2-phenylethyl) acetamide	0.009
	N-Butyl-N-ethyl acetamide	0.091

25 **Claims**

1. A repellent composition comprising (a) a synthetic blend of components which are characteristic of the acid fraction obtained by a Soxhlet extraction of lion faeces followed by separation into basic, neutral and acid fractions; and (b) L-felinine.
2. A repellent composition comprising (a) a synthetic blend of saturated alkanolic acids with carbon atoms in the range of 3-20; and (b) felinine.
3. A composition according to claim 1 or claim 2, wherein the weight ratio of felinine to saturated alkanolic acids is in the range 0.25:1 to 30:1 e.g. 10:1 to 25:1.
- 35 4. A composition according to any one of claims 1, 2 and 3 comprising any of:
  - saturated aliphatic alcohols with carbon atoms in the range 14-16;
  - aryl substituted saturated alkanolic acids;
  - any or all of
  - Pyrrolidine
  - Piperidine
  - 40 2-Pyrrolidone
  - 2-Phenyl ethylamine
  - 3-Methyl indole
  - Diethylamine
  - n-Propylamine
  - 45 n-Butylamine
  - 3-Methyl butylamine.
5. A composition according to claim 4, wherein
  - the weight ratio of C<sub>14</sub>-C<sub>16</sub> saturated aliphatic alcohols to saturated alkanolic acids is in the range 0.02-0.05:1 and/or
  - 50 the weight ratio of each of pyrrolidine, piperidine, 2-pyrrolidone, 2-phenyl ethylamine, 3-methyl indole, diethylamine, n-propylamine, n-butylamine and 3-methyl butylamine, which may be present is about 0.025:1.
6. A composition according to any one of the preceding claims comprising any of the following ingredients:
  - 55 n-Propanoic acid
  - 2-Methyl propanoic acid
  - n-Butanoic acid

- 2-Methyl butanoic acid
- 3-Methyl butanoic acid
- n-pentanoic acid
- 4-Methyl pentanoic acid
- 5 n-Hexanoic acid
- 2-Methyl hexanoic acid
- n-Heptanoic acid
- n-Octanoic acid
- 4-Methyl octanoic acid
- 10 n-Nonanoic acid
- 4-Methyl nonanoic acid
- n-Decanoic acid
- n-Undecanoic acid
- n-Dodecanoic acid
- 15 n-Tridecanoic acid
- n-Tetradecanoic acid (myristic acid)
- n-Pentadecanoic acid
- n-Hexadecanoic acid (palmitic acid)
- n-Octadecanoic acid (stearic acid)
- 20 n-Eicosanoic acid (arachidic acid)
- n-Tetradecanol
- n-Pentadecanol
- n-Hexadecanol
- Phenyl acetic acid
- 25 3-Phenyl propanoic acid
- 2-Phenyl ethanol
- Phenol
- 5-Amino-valeric acid
- 4-Methyl phenol
- 30 Indole
- Oxindole
- Oleic acid
- Linoleic acid
- Cholesterol
- 35 Benzothiazole
- 2-Phenoxyethanol
- $\gamma$ -Decalactone
- Palmitoleic acid (cis-9-hexadecenoic acid)
- Elaidic acid
- 40 Linolenic acid
- Eicosenoic acid
- 3 $\beta$ -Cholestanol.

7. A composition according to claim 6, comprising all said ingredients.

8. A composition according to any one of the preceding claims comprising any or all of:

- 45 3-Mercapto propanol
- 3-(Methylthio) propan-1-ol
- Dimethyl sulphide
- Dimethyl trisulphide
- Dimethyl tetrasulphide
- 50 N-(2-phenylethyl) acetamide
- N-Butyl-N-ethyl acetamide.

9. A composition according to any one of the preceding claims comprising a fermented egg product, prepared for example by fermenting whole chicken eggs, e.g. of the order of about 35 eggs per gram of saturated alkanolic acids in the composition.

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10. A composition according to any one of the preceding claims comprising (a) an agent to impart a bitter flavour to the composition, in an amount up to e.g. about 2% by weight of the composition, for example denatonium benzoate; or (b) an agent to impart adhesive properties to the composition in an amount e.g. 90-99% by weight of the composition, for example an adhesive aqueous acrylic emulsion; or  
5 both said agents (a) and (b).

11. A method of repelling animals e.g. deer, wherein a composition according to any one of the preceding claims is employed.

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54 Improvements in or relating to repellent compositions.

57 A repellent composition e.g. for repelling deer comprises a synthetic blend of components which are characteristic of the acid fraction obtained by a Soxhlet extraction of lion faeces followed by separation into basic, neutral and acid fractions; and feline. The composition may comprise saturated alkanolic acids with carbon atoms in the range of 3-20; saturated aliphatic alcohols with carbon atoms in the range 14-16; various compounds containing primary or secondary amino groups and having carbon atoms in the range 3-9; a fermented egg product; a bittering agent and an adhesive agent.

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# EUROPEAN SEARCH REPORT

Application Number

EP 88 30 1153

DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	CHEMICAL ABSTRACTS, vol. 68, 26th February 1968, page 3614, abstract no. 37305h, Columbus, Ohio, US; J. BORCHERS et al.: "The formation and biological role of felinine a sulfur containing isoprene derivative from cat urine", & DEUT. TIERAERZTL. WOCHENSCHR. 74(20), 532-5(1967) -----	1
		CLASSIFICATION OF THE APPLICATION (Int. Cl.4)  A 01 N 63/02 A 01 N 37/44
		TECHNICAL FIELDS SEARCHED (Int. Cl.4)  A 01 N
The present search report has been drawn up for all claims		
Place of search THE HAGUE	Date of completion of the search 10-06-1988	Examiner DECORTE D.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document		